

Operating instructions

SAT-TV Transmodulator

DVB-S/ S2 → DVB-C/ ITU-T J.83 Annex B, C



Contents

1. Safety and operating instructions.....	2
2. Device variants	2
3. General	2
4. Front view	3
5. Functional description.....	3
6. Adjustments	3
6.1 Adjustment with the Headend Controller	3
6.2 Adjustment with PC/ laptop	3
7. Meaning of status LED`s on front panel	4
8. Programming by web server	4
8.1 Main menu	4
8.2 Extended settings	5
8.3 NIT entries	5
8.4 Program filter	5
8.5 Data rate overview	6
8.6 Software overview	6
8.7 Device status	7
8.8 Factory settings	7
9. Manual menu control with Headend Controller	8
10. SNMP trap messages	8
11. Block diagram	9
12. Head end bus structure	9
13. Application example.....	10
14. Technical data	11
15. Glossary.....	11
16. Bibliography	12
17. Document history	12

**STB 016****Part N°: 9710.02***...Setting Signals*

1. Safety and operating instructions



When assembling, starting-up and adjusting the modules, it is necessary to consider the system specific references in the manual instruction!



The modules may only be installed and started up by authorized technical personnel!



When assembling the modules into the receiving points, the adherence of the EMC regulations is to be secured!



The assembly and wiring have to be done without voltage!



All active modules may only be operated with the Headend Controller HCB x00 or Bus Extender BEB x00!



The main voltage and the operating voltage of the modules working by DC have to be in compliance to the operating parameters described in the technical data.



With all work the defaults of the DIN EN 50083 have to be considered! Especially the safety relevant execution of the DIN EN 60728-11 [4] is necessary!

2. Device variants

STB 016 9710.02 DVB-S/ S2 → DVB-C/ ITU-T J.83 Annex B, C

Minimum software requirements for HCB x00:

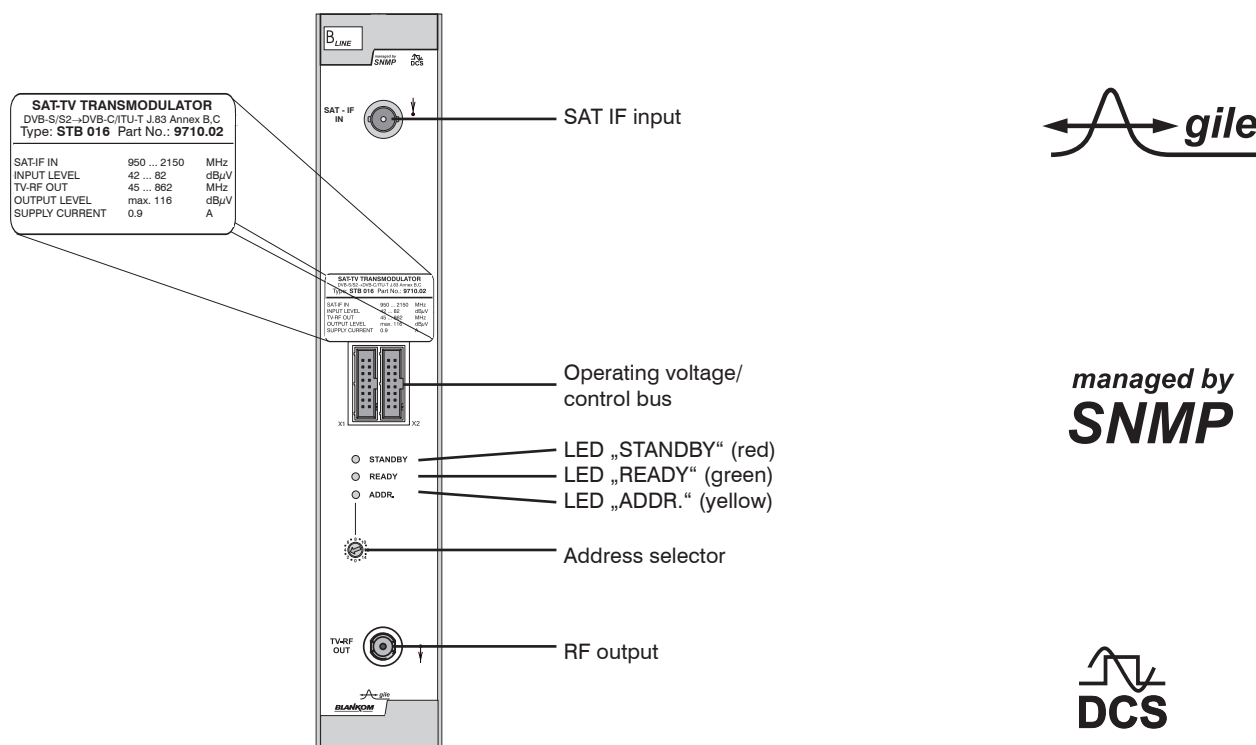
9650.03: Version 2.34*
9650.04/.05: Version 3.18*
9652.01: Version 3.23*

*) Updates: www.blankom.de

3. General

The SAT-TV transmodulator STB 016 is a module of the head end system B-LINE which is conceived as a complete system for middle-sized networks. The module converts one DVB-S/ S2 transponder into the digital cable standard DVB-C or ITU-T J.83 Annex B or C. The signals will be transcoded into cable TV channels. All modules will be programmed via a central control unit (HCB x00) and are working fully independent afterwards. The status of the modules are displayed via LED's (see chapter 7 "Meaning of status LED's on front panel").

4. Front view



5. Functional description

The SAT-IF input signal is fed to the DVB-S/ -S2 front end, where the selection of a transponder and its QPSK or 8PSK demodulation is done and a data stream is generated. All services of the resulting transport stream which shall be processed into the QAM modulator will be chosen by controlling software of the module. The SI and PSI tables affected (i.e. the PAT, PMT, SDT, EIT) are automatically corrected. The Headend Controller serves to generate an NIT (Network Information Table) into the transport stream. This is required to enable the receiver (such as Set-Top-Box) to tune in automatically. The changed SI and PSI tables are fed into the QAM modulator and an IF signal is generated at the output channel. There is a free choice of frequency in the output channel from 45 to 862 MHz. On the output side, the modulator does not leak to adjacent channels. So that errors in level can be signalled if the load fluctuates (the red LED will flash and a trap message will be sent), a reference level is generated. Every time the level for frequency figures are programmed, automatic measurement of the reference level takes place; this function will, however, not start until 100 seconds have elapsed after start-up of the system. This function can be enabled or disabled in the main menu.

6. Adjustments

6.1 Adjustment with the Headend Controller

- Adjustment of the addresses at the Bus Extender BEB x00 and at the modules
- Activation of the programming mode on each module by selecting the line (BEB x00) and the module position (01... 15) at the Headend Controller (HCB x00) → yellow LED illuminates until the beginning of the parameter adjustment
- Adjustment of the STB 016 parameters (see chapter 9) → green LED is switched on
- After the programming the STB 016 will be automatically switched into the operating mode → yellow LED flashes shortly / green LED is switched on

6.2 Adjustment with PC/ laptop

- Prerequisite for the remote programming is an "online - connection" according to the IP standard and an ethernet connection at the PC/ laptop
- Adjustment of the line/ position addresses at the Bus Extender BEB x00 as well as at the modules
- At the Headend Controller HCB x00 input IP address (e.g. 192.168.001.001)
- For "direct connection" between a PC and HCB x00 use crossover cable (RJ 45)
- For connection over a HUB use a normal straight through patch cable
- Start-up HTML browser and put in IP address as target address
- If connected correctly the web interface will be opened on the PC/ laptop and a blue LED (LINK) at the HCB x00 will be lit up.
- All adjustments of the modules are specified on the web interface.

The manual instructions of the Headend Controller HCB x00 and the Bus Extender BEB x00 have to be considered!

7. Meaning of status LED`s on front panel

Designation (Colour))	Status	Meaning of display
STANDBY (red)	permanently illuminated	Module is on standby
	flashing	Module faulty (hardware) or level error
READY (green)	permanently illuminated	Module working, everything ok
	flashing	Dysfunction depending in signal: Tuner not sync (e.g. in case of missing input signal) no input on the QAM modulator buffer overflow in the QAM modulator QAM overflow (input data rate on the QAM modulator too large)
	off	RF output is deactivated
ADDR. (yellow)	illuminated or flashing	Remote control making contact/ data transmission

8. Programming by web server *

8.1 Main menu

SAT-TV TRANSMODULATOR, STB 016
(9710.02 / 00), Address 00 / 14

Description

xxxx

Input

SAT-IF

1236

MHz

Symbol rate

27500

kSps

Status

SYNC

DVB-S

Output

Channel

S21 (306.00 MHz)

Attenuation

0

dB

QAM-Symbol rate

6900

kSps

QAM-Modulation mode

64

QAM

RF-Signal

On

Status

Operating mode QAM-Modulator

Transcoder

QAM-Standard

DVB-C (Annex A)

NIT-Processing

Off

CAT-Processing

Off

Change TS-Identification

Off

Program filter

Off

Operating status

On

[On]

SNMP trap message

On

Level monitoring

On

Factory settings

Load

Extended settings

NIT table

Program filter

Data rate overview

Software overview

Status

Reload

Transmit

<<<<

Back

>>>>

Name of device, item number, module address in head end

Description module name (max. 30 characters)

Input

SAT-IF adjustment range: 950 ... 2150 MHz
Symbol rate adjustment range: 2000 ... 45000 MSps
Status display wether **SYNC**hronization or **noSYNC**hronisation with input

Output

Channel channel selection accord. QAM standard:
DVB-C/ Annex A: 2 ... 69, standard B/G
Annex B, C: 2 ... 134, standard M
Dämpfung adjustment range: 0 ... 31.5 dB
QAM-Symbol rate selection: 6995, 6900, 6875, 6111, 6000, 3450, 1750 kSps

QAM-Modulation mode selection: 16, 32, 64, 128, 256 QAM
RF-Signal selection: On/ Off

Status

Operating mode according adjustment menu 1
QAM-Modulator DVB-C (Annex A)/ ITU-T J.83B (Annex B)/
QAM-Standard ITU-T J 83C acc. adjustment menu 1
NIT-Processing On/Off according adjustment menu 1
CAT-Processing On/Off according adjustment menu 1
Change TS-Identif. On/Off according adjustment menu 1
Program filter On/Off according adjustment menu 1

Operating status selection: On/ Off/ Reset
SNMP trap message selection: On/Off,if SNMP option in HCBx00 enabled, otherwise „locked“ display

Level monitoring On/Off
Factory settings setting the default values (see menu 7)

Routing to the appropriate adjustment menu

Extended settings see menu 1
NIT table see menu 2
Program filter see menu 3
Data rate overview see menu 4
Software overview see menu 5
Status see menu 6

* Further details on this are to be found in the HCB manual

8.2 Extended settings (menu 1)

SAT-TV TRANSMODULATOR, STB 016 (9710.02 / 00), Address 00 / 14	
Output	
Frequency	306000 kHz
QAM-Symbol rate	6900 kSps
Spectrum inversion	normal
QAM-Standard	DVB-C (Annex A)
Operating mode QAM-Modulator	Transcoder
Table processing	
NIT	
NIT-Processing	Off
Network name	none
Network ID	0 dez
CAT	
CAT-Processing	Off
CA-System ID	0 dez
Operator ID	0 dez
Transport stream	
Change TS-Identification	Off
Transport stream ID	0 dez
Network ID	0 dez
<input type="button" value="Reload"/> <input type="button" value="Back"/> <input type="button" value="Transmit"/>	

Name of device, item number, address in head end

Output

Frequency adjustment range: 45000 ... 862000 kHz
 QAM-Symbol rate adjustment range: 1000 ... 7200 kSps
 Spectrum inversion selection: normal/ invers
 QAM-Standard selection: DVB-C (Annex A), ITU-T/ J.83B (Annex B), ITU-T/ J.83C (Annex C)
 Operating mode selection: Transcoder, Test level, Test signal
 QAM-Modulator

Table processing

NIT
 NIT-Processing selection: On/ Off
 Network name adjustment range: max. 30 characters
 Network ID adjustment range: 0...65535

CAT

CAT-Processing selection: On/ Off
 CA-System ID adjustment range: 0...65535
 Operator ID adjustment range: 0...65535

Transport stream

Change
 TS-Identification selection: On/ Off
 Transport stream ID adjustment range: 0...65535
 Network ID adjustment range: 0...65535

8.3 NIT entries (menu 2)

SAT-TV TRANSMODULATOR, STB 016 (9710.02 / 00), Address 00 / 14					
Entry	Original TS-ID	Original Network ID	Frequency (kHz)	QAM Symbolrate (kSps)	Modulation (QAM)
1	1101	1	306000	6900	64
NIT distribution: dynamically					
Network name: none					
Network ID: 0					
<input type="button" value="Reload"/> <input type="button" value="Back"/>					

Name of device, item number, address in head end

NIT entries with all information available

8.4 Program filter (menu 3)

SAT-TV TRANSMODULATOR, STB 016 (9710.02 / 00), Address 00 / 14		
Program filter configuration		
Filter function	Off	
Other transponder information	Pass	
Program selection		
Operating mode	Drop	
Service ID	Program name	Selection
0x6DCA	Das Erste	<input checked="" type="checkbox"/>
0x6DCB	Bayerisches FS Süd	<input checked="" type="checkbox"/>
0x6DCC	hr-fernsehen	<input type="checkbox"/>
0x6DCE	Bayerisches FS Nord	<input type="checkbox"/>
0x6DCF	WDR Köln	<input checked="" type="checkbox"/>
0x6DD0	BR-alpha*	<input type="checkbox"/>
0x6DD1	SWR Fernsehen BW	<input checked="" type="checkbox"/>
<input type="button" value="Reverse selection"/> <input type="button" value="Select all"/> <input type="button" value="Clear all"/>		
<input type="button" value="Data rate overview"/>		
<input type="button" value="Reload"/> <input type="button" value="Back"/> <input type="button" value="Transmit"/>		

Name of device, item number, address in head end

Program filter configuration

Filter function selection: On/ Off
 Other transponder information pass or drop of additional informations (e.g. electronic program guide), which are contained in data stream as "other"

Program selection

Operating mode pass or drop of the marked programs

Reserve selection all not marked programs are choosen or vice versa

Select all all programs of the list are marked

Clear all no program of the list is marked

Data rate overview routing to menu 4

8.5 Data rate overview (menu 4)

SAT-TV TRANSMODULATOR, STB 016 (9710.02 / 00), Address 00 / 14			
Input data rate	38.014	MBit/s	
Data rate by filter	36.390	MBit/s	
max. QAM-Data rate	38.152	MBit/s	
Reserve	1.761	MBit/s	
		Reload	Back

Name of device, item number, address in head end

Input data rate net data rate at the input
 Data rate by filter net data rate by program filters
 max. QAM Data rate max. possible net data rate
Reserve max. QAM data rate minus data rate by filter

8.6 Software overview (menu 5)

SAT-TV TRANSMODULATOR, STB 016 (9710.02 / 00), Address 00 / 14			
Version			
AP Controller	9710.02-81.01 Steuercontroller Anschluss-LP V1.06 18.02.2009 JR		
FPGA Boot Controller	9710.02-88.01 FPGA Boot Controller(2) V1.02 24.04.08 JR		
FPGA	9710.02-87.01 TS-Mux,QAM-Modulator V1.05 13.01.2009 WE,JR		
Nios	9710.02-86.01 TS-Manager V1.04 20.02.2009 JR		
S2-NIM Controller	9619.05-88.02 S2-NIM-Controller H2V1.02 07.06.2006 PK		
Up Converter	9199.01-88.02 internal Controller V2.00 26.06.2008 JH		
		Back	

Name of device, item number, address in head end

Software version

Controller of terminals board

FPGA boot controller

QAM modulator, TS-Mux (FPGA)

TS manager

S2-NIM controller

Up Converter controller

8.7 Device status (menu 6)

SAT-TV TRANSMODULATOR, STB 016 (9710.02 / 00), Address 00 / 14		
Tuner		
Status	SYNC	
Mode	DVB-S	
Set values	Sat ZF:1237 Symbolrate:27505	
BER	<1.192E-07	
Input data rate	38.014 MBit/s	
FPGA Status		
FPGA Status	Transport stream OK	
FPGA error memory	empty	
Up Converter error memory	empty	
Original TS-ID's		
Original TS-ID's	TS-ID: 1101 Network-ID: 1	
Information		
Temperature	87 °F	
Device number	0000000	
Device index	00	
<input type="button" value="Reload"/> <input type="button" value="Back"/>		

Name of device, item number, address in head end

Tuner

Status displays whether **SYNC**hronization or **noSYNC**hronization
 Mode format of transmission
 Set values displays SAT-IF and symbol rate
 BER bit error rate
 Input data rate displays net data rate

FPGA Status status, transport stream input
 FPGA error memory error memory TS mux, QAM modulator
 Up Converter error memory error memory up converter

Original TS-ID's displays transport stream ID and network ID

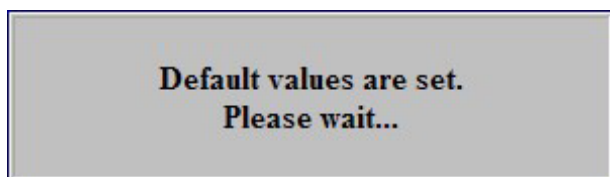
Information

Temperature temperature of terminals board
 Device number display of the device number
 Device index display of the device index (hardware)

8.8 Factory settings (menu 7)

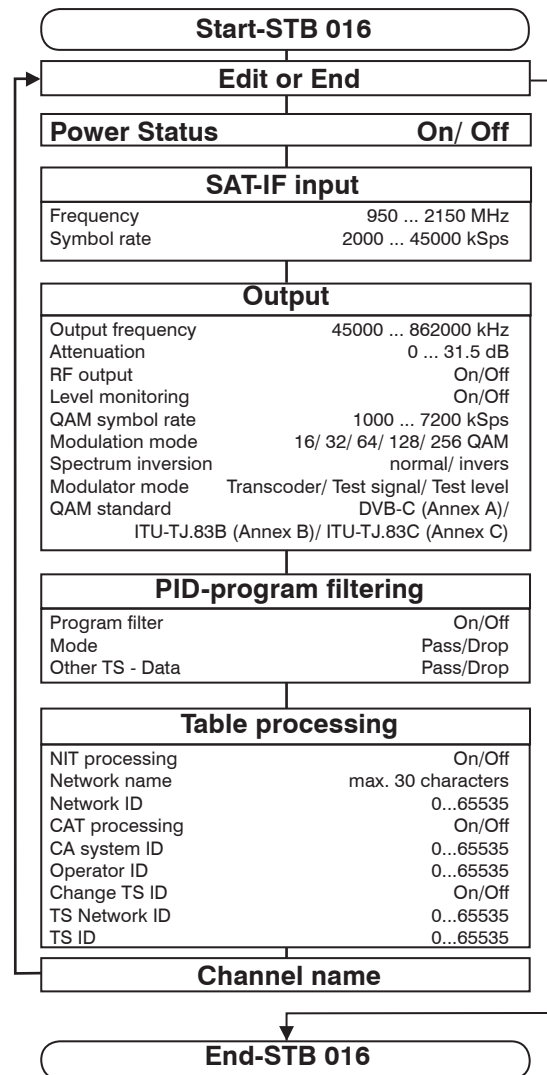


When request this menu item at first a security query whether it really set all parameters to the factory default settings pops up.



Affirming the query, all settings made on the EEPROM will be deleted and replaced by the default settings. The modul will go back to these default values. Once the setting process is over, there will be automatic return to the main menu. It takes about one minute.

9. Manual menu control with Headend Controller (HCB x00)

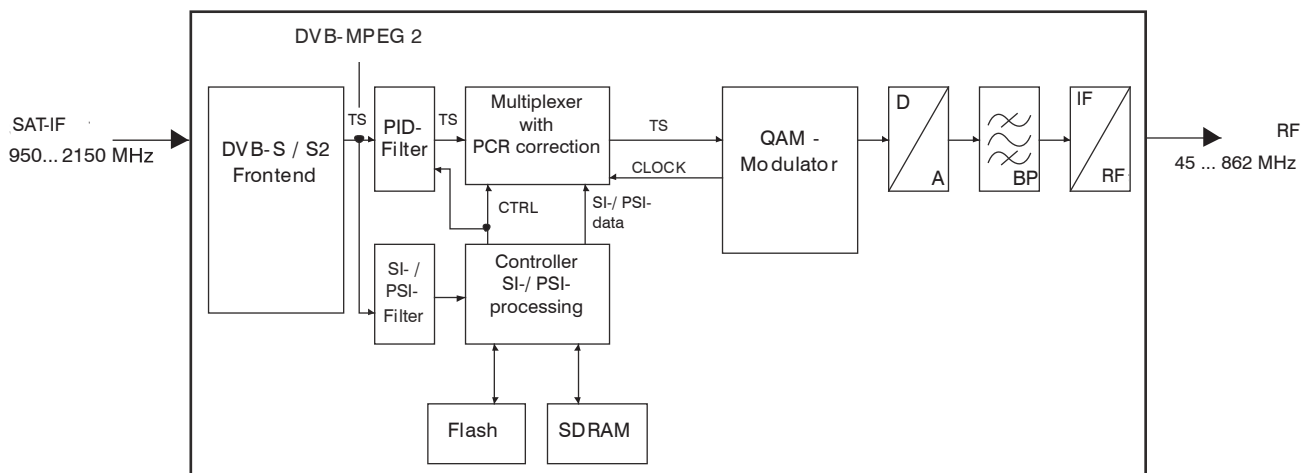


10. SNMP trap Messages

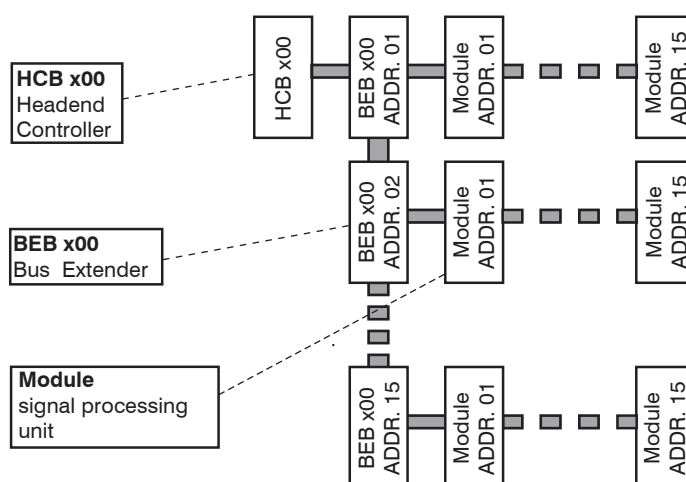
Item	Message	Message Type	Message
01	Power fail	CRITICAL	short circuit
02	System Reset	WARNING	reset by internal error
03	Signal OK	INFORMATION	module works correctly
04	Tuner not sync	WARNING	no input signal at the tuner
05	IIC error	CRITICAL	IIC-Bus-error
06	TS-MUX not sync	WARNING	no transport stream at the FPGA
07	Internal controller reset	WARNING	error when accessing internal controller
08	FPGA: Program memory full	WARNING	overflow of program memory in the FPGA
09	FPGA: PID memory full	WARNING	overflow of PID memory in the FPGA
10	FPGA: Directory full	WARNING	overflow of Directory in the FPGA
11	FPGA: FAT memory full	WARNING	overflow of FAT memory in the FPGA
12	FPGA: TS-Packed buffer overflow	WARNING	overflow of TS-Packet buffer
13	QAM overflow	CRITICAL	overflow of QAM
14	Sync error data FIFO	CRITICAL	data FIFO doesn't work correctly
15	No response to OPEN command	CRITICAL	error internal port

Item	Message	Message Type	Message
16	Up Converter: PLL1 not locked	CRITICAL	no funktion at the PLL 1 converter
17	Up Converter: PLL2 not locked	CRITICAL	no funktion at the PLL 2 converter
18	Up Converter: IF input too small	WARNING	IF input too small at the Up converter
19	Up Converter: IF input too large	WARNING	IF input too large at the Up converter
20	Up Converter: RF output too small	WARNING	RF output too small at the Up converter
21	Up Converter: RF output too large	WARNING	RF output too large at the Up converter

11. Block diagram

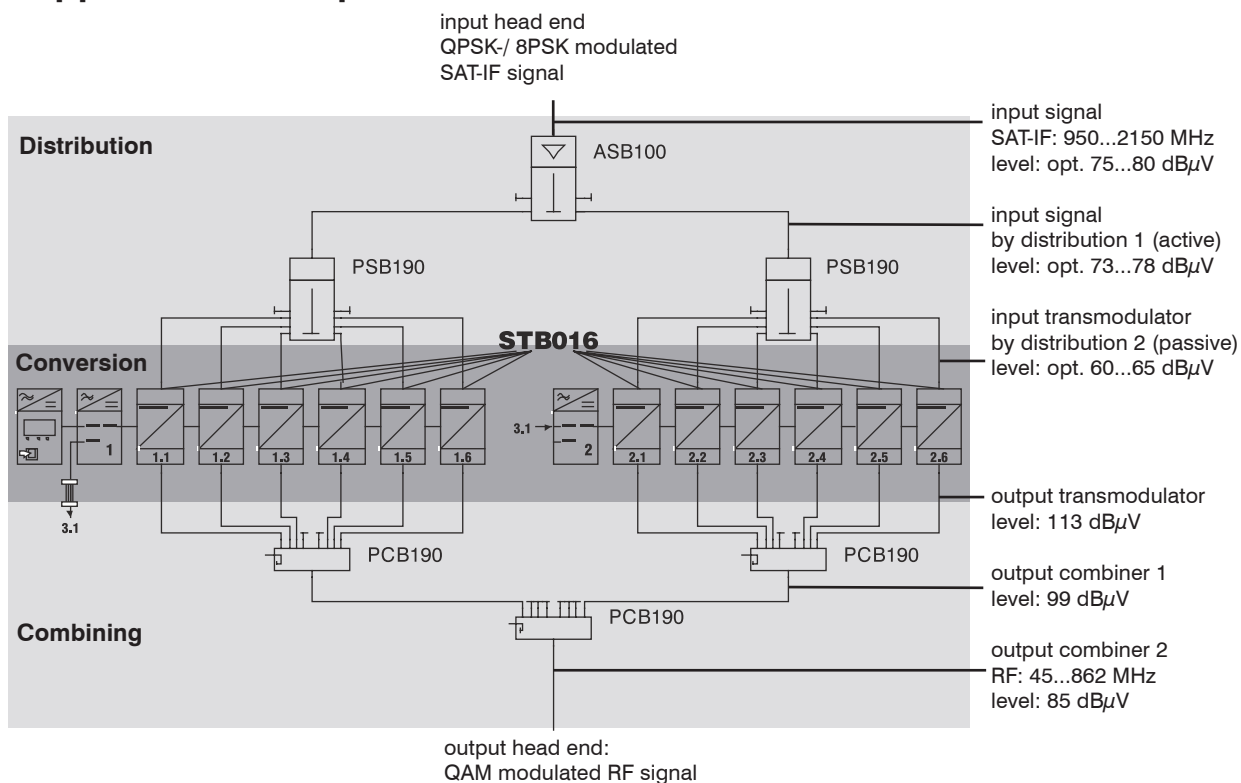


12. Head end bus structure



The number of the possible module connections (01 ... 15) to a BEB x00 depends on the total power consumption of this line!

13. Application example



14. Technical data**SAT-IF input**

Frequency range	950...2150 MHz
Frequency step	1 MHz
AFC range	± 3 MHz (SR < 10 MSps) ± 5 MHz (SR ≥ 10 MSps)
AGC level range	42 ... 82 dB μ V
Connector	F socket
Impedance	75 Ω

DVB-S demodulator (QPSK)

Symbol rate	2...45 MSps
Code rate (Viterbi)	1/2, 2/3, 3/4, 5/6, 7/8
Roll off	35 %
Signal processing	ETS 300 421 [1]

DVB-S2 demodulator (QPSK, 8PSK)

Symbol rate	QPSK	1...34 MSps
	8PSK	1...28.9 MSps
Code rate (LDPC)	QPSK	1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
	8PSK	3/5, 2/3, 3/4, 5/6, 8/9, 9/10
Roll off		20, 25, 35 %
Signal processing		ETS 302 307 [2]

QAM modulator

Input data rate	max. 78 Mbps according adjustment symbol rate & QAM constellation
Symbol rate	1.0-7.2 MSps
QAM modulation	ITU-T J.83 Annex B, C, DVB-C

	Annex B	Annex C	DVB-C
QAM constell.	64; 256	64	16; 32; 64; 128; 256
Roll off	12 %, 18 %	13 %	15 %
Interleaving	Conv. I=128, J=4	Conv. I=12	Conv. I=12
Forward error correction (FEC)	Reed Solomon (128,122) + Trellis	Reed Solomon (204, 188,8)	Reed Solomon (204, 188,8)

Test signals	according adjustment symbol rate & QAM constellation
Measurement signal	unmod. carrier (signal level)
PSI-/ SI processing	disconnectable
Zero stuffing	continuously
Signal processing	EN 300 429 [3] ITU-T J.83 Annex B, C [5]

RF Output

Output frequency range	45 ... 862 MHz
Tuning step	125 kHz
Max. output level	116 dB μ V
Level adjustment range	0 ... 31.5 dB (0.5 dB steps)
Channel allocation	adjacent channel ability
Connector	F socket
Impedance	75 Ω
Return loss	≥ 18 dB 45 MHz - 1.5 dB/ octave

Signal quality

MER	≥ 45 dB
Shoulder attenuation	≥ 58 dB
Spurious 45...862 MHz	≥ 60 dB
C/N (> 25 MHz space from channel center)	
BW = 4,8 MHz	typ. 80 dB
BW = 6 MHz	typ. 79 dB
BW = 8 MHz	typ. 78 dB

Phase noise	1 kHz; typ. -92 dBc/ Hz 10 kHz; typ. -101 dBc/ Hz 100 kHz; typ. -108 dBc/ Hz
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max. frequency stability	30 kHz
Output level stability	± 0.5 dB
Amplitude frequency response channel (8 MHz)	max. 1 dB _{pp}

Operating parameters

Voltage/ current	12 V (0.2 V)/ max. 900 mA
Residual ripple of the supply voltage	10 mV _{pp}

Environmental conditions

Temperature range	-10 ... +55 °C
Temperature range for data keeping	5 ... 45 °C
Relative humidity	≤ 80 % (non condensing)
Method of mounting	vertical
Location of mounting	splash-proof and drip-proof

Miscellaneous

Dimensions (l x w x h)	
without 19" - adapter	50 x 276 x 148 mm
with 19" - adapter	50 x 301 x 148 mm
Weight	1,190 g

Delivery content

1 x bus connector

15. Glossary

8PSK
AFC
AGC
APL
BER
BW
CA
CAT
DVB
EIT
ETSI
FAT
FEC
FPGA
HTTP
I/Q
ID
IF
IIC
IP

8 Phase Shift Keying
Automatic Frequency Control
Automatic Gain Control
Anschlussplatte (Terminals board)
Bit Error Ratio
Bandwidth
Conditional Access
Conditional Access Table
Digital Video Broadcasting (-C Cable, -S Satellite, -S2 Satellite 2, -T Terrestrial)
Event Information Table
European Telecommunications Standards Institute
File Allocation Table
Forward Error Correction
Field Programmable Gate Array
Hypertext Transfer Protocol
In-phase/ **Q**uadrature-phase
Identifier
Intermediate Frequency
Inter-Integrated Circuit (I²C-Bus, data bus within device)
Internet Protocol

LDPC	Low Density Parity Check Code
LED	Light Emitting Diode
MAC	Media Access Control
MER	Modulation Error Ratio
MIB	Management Information Base
MPEG	Moving Picture Experts Group
MPTS	Multi Program Transport Stream
NIM	Network Interface Module
Nios	product name for a processor
NIT	Network Information Table
PAT	Program Association Table
PCR	Program Clock Reference
PID	Program Identifier
PMT	Program Map Table
PSI	Program Service Information
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keying
RF	Radio Frequency
SDT	Service Description Table
SI	Service Information
SNMP	Single Network Management Protocol
SPTS	Single Program Transport Stream
TS	Transport Stream

16. Bibliography

- [1] EN 300 421: Digital Video Broadcasting (DVB): Framing structure, channel coding and modulation for 11/12 GHz satellite services
- [2] EN 302 307: Digital Video Broadcasting (DVB): Second generation framing structure, channel coding and modulation systems for Broadcasting, Interactive Services, News Gathering and other broadband satellite applications
- [3] EN 300 429: Digital Video Broadcasting (DVB): Framing structure, channel coding and modulation for cable systems
- [4] EN 60728-11: Cable networks for television signals, sound signals and interactive services Part 11: Safety (IEC 60728-11:2005); German version EN 60728-11:2005
- [5] ITU-T J.83 Digital multi-programme systems for television, sound and data services for cable distribution, Amendment to Annex B and C (2006)
- [6] EN 50083-2 : Cabled distribution systems for television and sound signals. Electromagnetic compatibility for equipment; EN 50083-2:2001
- [7] RFC 1157 Request for Comments (RFC): RFC Database URL: [Http://www.rfc-editor.org/rfc.html](http://www.rfc-editor.org/rfc.html)

17. Document history

Version	Date	Modification	Author
1.00	18.07.2008	basic document	Poch
1.01	03.09.2009	revision	Häußer

Declaration of Conformity

The Manufacturer

BLANKOM Antennentechnik GmbH · Hermann-Petersilge-Str. 1 · 07422 Bad Blankenburg · Germany

herewith declares the conformity of the product

Product name: SAT-TV Transmodulator

Type: STB 016

Product number: 9710.02

according to the following regulations

EN 50083-2

EN 60728-11 (as far as relevant)

and additional device-specific regulations, enclosed above, which this product is subjected to.

Date: 03.09.2009

Signature:



(Managing Director)